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Influence of climate and land use changes on recent trends of soil erosion rates within the Russian Plain

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Abstract

© 2018 John Wiley & Sons, Ltd. The Russian Plain (within the Russian Federation) occupies an area of approximately 3.5 × 106 km2. Water erosion is the main land degradation factor within the Russian Plain. Previous quantitative assessments of erosion rates for the entire area of the Russian Plain were undertaken in the 1980s. The application of erosion models and analysis of different factor dynamics allow for the evaluation of the mean annual total soil losses and erosion rates for the post-Union of Soviet Socialist Republics period, as well as the determination of the trends of erosion rates and soil losses for different landscape zones, for 1980 and 2012. The significant reductions of cultivated land area in all of the landscape zones after 1991 are the main reason behind the 46% reduction in the total annual soil losses in 2012 compared with 1980. The most significant decrease in the soil erosion rate for cultivated lands (from 7.3 Mg ha−1 yr−1 in 1980 to 4.1 Mg ha−1 yr−1 in 2012) was identified in the forest zone of the Russian Plain. Soil erosion rates slightly decreased in the forest-steppe zone and increased in the steppe zone (from 3.9 to 4.6 Mg ha−1 yr−1). We attribute the decreasing erosion rates in the forest and forest-steppe zones to the reduction of surface runoff during snowmelt. The increased use of perennial grasses in crop rotations promoted the reduction of erosion rates in the forest zone. The increasing erosion rates in the steppe zone were attributed to the increasing frequency of heavy rainstorms.

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Keywords

climate change, land use change, Russian Plain, soil erosion rate, USLE

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